CCPS Science Unit Plan

<table>
<tr><td>Grade</td><td>10-12</td><td>Subject</td><td>Chemistry</td><td>Unit #</td><td>3</td></tr>
<tr><td>Unit Name</td><td colspan="2">Matter, Energy, and Equilibrium</td><td>Timeline</td><td colspan="2">Five weeks</td></tr>
<tr><td>How to use the Framework</td><td colspan="5">This Framework should be used to implement daily science instruction. The resources and instructional strategies reflected in the Framework will provide a foundation for effective implementation and student mastery of standards. Please see the hyperlinked abbreviation document to ensure understanding of all abbreviations used with this framework.</td></tr>
<tr><td>Unit Overview</td><td colspan="5">Learning Objective: Students will explain the properties and behaviors of different states of matter using evidence from their explorations on states of matter, mixtures, and solutions, energy and chemical change, chemical equilibrium, and acids and bases</td></tr>
<tr><td>Lesson Plan guidance document and template</td><td colspan="5">CCPS Lesson Plan Template Day View
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<tr><th>GSE</th><th>Science and Engineering Practices</th><th>Crosscutting Concepts</th></tr>
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<td>SC2g. Develop a model to illustrate the release or absorption of energy (endothermic or exothermic)from a chemical reaction system depends upon the changes in total bond energy.
SC3. Obtain, evaluate, and communicate information about how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions.
a. Use mathematics and computational thinking to balance chemical reactions (i.e., synthesis,decomposition, single replacement, double replacement, and combustion) and construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
b. Plan and carry out an investigation to determine that a new chemical has been formed by identifying indicators of a chemical reaction (e.g., precipitate formation, gas evolution, color change, water production, and</td>
<td>• Obtaining, Evaluating, and Communicating Information
• Planning and Carrying Out Investigations;
• Constructing an Argument
• Constructing Explanations
• Developing and Using Models
• Asking Questions and Defining problems</td>
<td>• Patterns
• Systems and System Models
• Energy and Matter
• Cause and Effect</td>
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	changes in energy to the system). **c. Use mathematics and computational thinking to apply concepts of the mole and Avogadro's Number to conceptualize and calculate** **• percent composition• empirical/molecular formulas** **• mass, moles, and molecules relationships** **• molar volumes of gases** **d. Use mathematics and computational thinking to identify and solve different types of reaction stoichiometry problems (i.e., mass to moles, mass to mass, moles to moles, and percent yield) using significant figures. (Clarification statement: For elements c and d emphasis is on use of mole ratios to compare quantities of reactants or products and on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.)** **e. Plan and carry out an investigation to demonstrate the conceptual principle of limiting reactants.** **SC4. Obtain, evaluate, and communicate information about how to refine the design of a chemical system by applying engineering principles to manipulate the factors that affect a chemical reaction.** **a. Plan and carry out an investigation to provide evidence of the effects of changing concentration, temperature, and pressure on chemical reactions. (Clarification statement: Pressure should not be tested experimentally.)** **b. Construct an argument using collision theory and transition state theory to explain the role of activation energy in chemical reactions. (Clarification statement: Reaction coordinate diagrams could be used to visualize graphically changes in energy (direction flow and quantity) during the progress of a chemical reaction.)** **c. Construct an explanation of the effects of a catalyst on chemical reactions and apply it to**		

	everyday examples. **d. Refine the design of a chemical system by altering the conditions that would change forward and reverse reaction rates and the amount of products at equilibrium. (Clarification statement: Emphasis is on the application of LeChatelier's principle.)** **SC5. Obtain, evaluate, and communicate information about the Kinetic Molecular Theory to model atomic and molecular motion in chemical and physical processes.** **a. Plan and carry out an investigation to calculate the amount of heat absorbed or released by chemical or physical processes.** **(Clarification statement: Calculation of the enthalpy, heat change, and Hess's Law are addressed in this element.)** **b. Construct an explanation using a heating curve as evidence of the effects of energy and intermolecular forces on phase changes.** **c. Develop and use models to quantitatively, conceptually, and graphically represent the relationships between pressure, volume, temperature, and number of moles of a gas.**		
NGSS Alignment	**NGSS Alignment to Disciplinary Core Ideas**		

Weekly Lesson Tasks

Week 1	
GSE: SC5.c	**Focused Concept:** • **Boyle's Law** • **Charles's Law** • **Gay Lussac's Law** • **Combined Gas Laws** • **Ideal Gas Law**

Phenomenon: Daily Phenomenon are found in the opening			**DQ: The following questions should be the focus of week 1** **States of matter:** • **How is the kinetic molecular theory used to explain the behavior of gasses?** • **Why does mass affect the rates of diffusion and effusion?** • **How is gas pressure measured, and how is the partial pressure of a gas calculated?**		
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Learning Target	**SWBAT** calculate Boyles's law of a given mass of a gas with a constant temperature. **SWBAT** investigate Boyles's Law through an inquiry lab**.** **Focus Question:** How is pressure and volume related?	**SWBAT** explain Charles's Law and understand the concept of volume being directly proportional to temperature at constant pressure. **Focus Question:** How are gas, temperature, and volume related?	**SWBAT** Explain and apply Gay Lussac's Law, and calculate the behavior of gasses in various conditions. **Focus Question:** How are gas, temperature, and pressure related?	**SWBAT** demonstrate an understanding of how pressure, volume, and temperature are related in a gas sample by applying the combined gas laws. **Focus Question:** How are gas temperature, pressure, and volume related?	**SWBAT** connect prior knowledge with the concept of the ideal gas law. **Focus Question:** What happens when you change the amount of gas present?
Opening **(10-15 minutes)**	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: How do hot air balloons fly? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What are the relationships between the temperature and volume of the gas?What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to	TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: Why water naturally exist as a solid, liquid, and gas on Earth? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What happens when you change the amount of gas present? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the

		generate claims for the focus question.			focus question.
Guided Practice/ Transition to Work **Key Vocabulary:** • Boyle's Law • Charles' Law • Combined Gas Law • Pressure • Volume • Temperature	**TTW** lead students in discussing the following misconceptions using the Agree/Disagree strategy. **TTW** display the statement on the Mimio Board and ask students to stand on the right side of the room if they agree with it or on the left if they disagree. **TTW** invite students to share their thoughts on the statement, and the teacher will clarify the misconception before moving on to the next statement. **MISCONCEPTIONS** **TTW** distinguish between natural gasses and ideal gasses using the **Gas laws PPT** **Note: Only cover Boyle's Law on this day**	**TTW** lead the calculation using Charles's law section of the presentation. **TTW** discuss conversions and model Charles' Law problems on page 386.	**TTW** establish the relationship between pressure and temperature using the simulations. **TTW** lead the students to solve Gay Lussac's law using the example on the PowerPoint.	**TTW** lead students to solve problems using combined gas law $\frac{P1V1}{T1} = \frac{P2V2}{T2}$ (All gas laws temperature should be in kelvin) on page 391	**TTW** provide direct instruction to introduce the ideal gas law PV=nRT and define each variable. **TTW** introduce the concept of Avogadro's law. **TTW** model how to solve example problems on Solve problems on page 393. **TTW** introduce gas law density and solve problems on page 399 using $M = \frac{mRT}{PV}$
Independent Practice	**TSW** complete Pivot Interactive part 1 and part 2, Applying Boyle's Law. The alternative lab BOYLES' LAW VERIFICATION LAB can be done if the school has LabQuest2 for data collection. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete the Charles law lab**.** **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** practice problems on page 388. Each group of students will demonstrate a problem to the class. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete the IDEAL GAS LAW WORKSHEETS. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete Ideal Gas Laws worksheet problems #1-5 in groups. **TSW** complete the gas law CER. **TTW** circulate the room to provide support by asking probing questions to guide student thinking. **TTW** review problems #1-5. **GAS LAWS CER**

					GAS LAWS CER TRS KEY
Assessment/Summary	**TSW** answer the focus question related to Boyle's Law on a Post-it and place it on chart paper. **TTW** clear up any misunderstandings regarding the focus question.	**TSW** explain their reasoning to the following question: "If the temperature of a gas is doubled while keeping the volume and number of moles constant, what happens to the pressure of the gas? Use Charles' Law to explain your reasoning." **Homework:** Charles Law practice problems page 386.	**TSW** answer the following true/false questions and explain their answer: According to Gay-Lussac's Law, if the temperature of a gas is halved, the pressure will also be halved if the volume remains constant.	**TSW** explain how the Combined Gas Law combines the principles of Boyle's Law, Charles's Law, and Gay-Lussac's Law.	**TSW** describe a real-world situation where Avogadro's Principle can be applied. How does the principle help explain the behavior of gasses in this situation?
Small Group Tasks (TBA)					

Week 2					
GSE: SC6. a, b, d, e,	**Focused Concept: Mixtures and Solutions:** ● **Differentiate between mixtures and solutions and clear the misconceptions that all mixtures are solutions.** ● **Calculate the concentration of a solution in terms of molarity; using the formula M=Number of moles /Volume in Liters. Number of moles =Mass of substance /Molar mass of the substance** ● **Distinguish between dissolution and solvation** ● **Identify factors that affect the rate at which a substance dissolves (solute/solvent).**				
Phenomenon: Daily Phenomenon are found in the opening			**DQ:** ● **How is a solution formed?** ● **What are the differences between a colloid and a suspension?**		
	Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**

Learning Target	**SWBAT** differentiate between homogeneous and heterogeneous solutions **SWBAT** gives examples of homogeneous and heterogeneous solutions. **Focus Question:** Do all mixtures have a uniform composition?	**SWBAT** identify the factors affecting solubility. **SWBAT** describe the solvation process. **Focus Question:** Why do some substances dissolve in water while others don't?	**SWBAT** determine the solubility of any salts using graphical dissolution. **SWBAT** discuss and define saturated, unsaturated, and supersaturated solutions. **Focus Question:** How much solute dissolves in the solvent at any given temperature?	**SWBAT** explain and discuss the colligative properties of water. **Focus Question:** Why do we salt the roads when it's cold outside?	**SWBAT** measure pure water vapor's and various solutions' pressure, boiling point, freezing point, and osmotic pressure. **Focus Question:** Why do we salt the roads when it's cold outside?
Opening	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW conduct a short demonstration by showing a beaker in which salt is dissolved in water and another with sand dissolved in water. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW drop a piece of wax candle in a beaker of water. • TTW drop Alka Seltzer tablets in water. • TTW ask students: Why will the wax not dissolve in water? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: Why do we salt the roads when it's cold outside during snow? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.

Guided Practice/Transition **Key Vocabulary:** • Solution • Solute • Solvent • Mixture • Homogeneous • Heterogeneous • Tyndall effect • Brownian motion • Miscible • Immiscible • Soluble • Insoluble • Suspension • Colloid	**TTW** make two types of mixtures, Heterogeneous and Homogeneous mixtures. **TSW** work in groups to discuss and write about the differences between Heterogeneous mixtures. **TTW** explain Brownian motion and Tyndal effects.	**TTW** use the PowerPoint to explain factors affecting solubility and the solvation process. SOLVATION PROCESS **TTW** show students the aqueous solution of a molecular compound water molecule responsible for the solubility.	**TTW** show the different points on the graph (below the graph, line=unsaturated; on the line saturated; above the line is supersaturated) PowerPoint	**TTW** lead students to solve problems using Henry's Law on pgs 434- 435. S1 = S2 P1 P2	**TTW** use Colligative Property Gizmo to discuss the colligative properties of water. **TSW** complete the Colligative property Gizmo warm up.
Independent Practice	**TSW** work in groups of 3-4 students to complete mixture lab. **TSW** rotate between 3 stations, spending 10 minutes at each station. **TSW** write down their observations in their notebook. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete the solutions and solubility curves on the pivot interactives. **TTW** provide support to students by asking probing questions to guide students thinking and re-teaching concepts when needed.	**TSW** work in groups to complete the solubility WS. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** read and annotate, "A Hard Day at the Laundromat". **TSW** work in groups of 3-4 to perform the experiment for, "A Hard Day at the Laundromat". **TSW** work in groups of 3-4 to create an argument for the writing prompt: convince the owners of a small, five-bedroom bed-and-breakfast inn that they should install a water softening unit in their inn. the property of water **TTW** provide support to students by asking probing questions to guide students' thinking and reteaching concepts when needed.	**TSW** complete the Colligative property of water Gizmo Activities. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.
Assessment/Summary	**TSW** complete Types of solution Exit ticket	**TSW** complete an exit ticket on the PowerPoint.	**TSW** complete the assessment questions from	**TSW** complete solution and solubility curves in the	**TSW** complete the lesson check the Colligative

	on Google form or printed. **Homework:** Teacher will assign the mixtures and solutions worksheet from pages 222-225	**TTW** check for student's mastery by showing pictorial representations of the solvation process.	the ebook.	pivot interactives. It can be completed at home as homework.	Properties of Solutions ebook.
Small Group Tasks (TBA)					

Week 3					
GSE: SC5a .b	**Focused Concept: Energy and Chemical Change** **Students will** • **plan and investigate chemical reactions to determine if a process releases or absorbs heat.** • **calculate a chemical process's enthalpy using Hess's Law and q=mCΔT.** • **using heating curves as evidence, explain the effects of energy and intermolecular forces on phase changes.**				
Phenomenon: Daily phenomena are found in the Opening			**DQ: The following questions will be the focus of the week?** • **What is energy?** • **How much heat is released during a rocket launch?** • **How to use q=mCΔT to calculate heat and mass?** • **Are all reactions that release energy spontaneous?** • **How to calculate an average reaction rate?** • **Can chemical reactions slow down or speed up?** • **What is the reaction order of a reaction?**		
	Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
LearningTarget	**SWBAT** define energy and converts the Joules to calories and vice versa. **SWBAT** calculate the heat absorbed or produced from a system during a chemical reaction. **Focus Question:** What is energy?	**SWBAT** calculate the enthalpy of a chemical reaction using Hess's law. **Focus Question:** How much energy is released when a rocket launches?	**SWBAT** identify the entropy of different states of matter. **SWBAT** explain the changes in entropy of states of matter in chemical reactions. **SWBAT** calculate enthalpy change. **Focus Question:** Are all reactions that release energy spontaneous	**SWBAT** define collision in terms of chemical reactions. **SWBAT e**xplain factors affecting the rate of reactions. **Focus Question:** Can chemical reactions speed up or slow down?	**SWBAT** determine the reaction rate order. **SWBAT** verify Beer-Lambert's Law by plotting concentration versus absorbance. **Focus Question:** What is the relationship between reaction rate and concentration

Opening	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: how much energy is released? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: How is this frog frozen but still alive? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.
Guided Practice/Transition **Key Vocabulary:** • Exothermic • Endothermic • Heat • Temperature • Collision • Entropy	**TTW** convert 1 J=0.2390 Cal. **TSW** calculate the calories consumed on consuming doughnuts or chips using the labels 1 Calorie= 4.184 J.Lead the students to solve page 451 ebook problems. **TTW** lead the solving of the issues on pages 452-454 using Heat change =mc dT where m=mass,c = specific heat capacity. dT change in temperature.	**TTW** use the following examples to explain Hess's Law Hess's law ppt.	**TTW** use PowerPoint to explain Entropy and Enthalpy ENTROPY AND ENTHALPY PPT.	**TTW** use the PowerPoint and examples on the ebook page COLLISION THEORY. **TTW** explain the graph on the rate of reaction. **TTW** catalyzed and uncatalyzed reaction rates, assigned work on page 506.	**TTW** demonstrate the reaction of vinegar and baking soda. **TSW** THE EXPLANATION GAME **TTW** introduce reaction rate law referencing the rate of reactions on page 507 and PowerPoint notes REACTION RATE ORDER
Independent Practice (45-50 minutes)	**TSW** work in groups of 3-4 students to solve the	**TSW** complete questions on page 468.	**TSW** complete the problems from the textbook	**TSW** complete factors affecting reaction rates on	**TSW** work in groups of 3-4 students to complete

	heat change problems. HEAT CHANGE PROBLEMS **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TTW** circulate the room to provide support by asking probing questions to guide student thinking.	ebook on page 480. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	students' lesson check ebook. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	reaction rate law on pivot interactives to verify Beer's Law. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.
Assessment/Summary (5-10 minutes)	**TSW** complete the assessment questions on page 454.	**TSW** complete the Lesson check: Calculating Enthalpy Change ebook.	**TSW** complete the exit ticket on the PowerPoint.	**TSW** complete the collision theory lesson check on ebook	**TSW** write a CER that answers the focus question: What is the relationship between reaction rate and concentration? **Homework:**complete questions 19-21 on page 510
Small Group Tasks (TBA)					

Week 4					
GSE: SC4. d,f SC 6f,g,h	**Focused Concept:** • **Chemical Equilibrium – Dynamic Equilibrium; Factors Affecting Chemical Equilibrium; Using equilibrium constants** • **Acids and bases:– Introduction to Acids and Bases; Strengths of Acids and Bases; Hydrogen Ions and pH; Neutralization**				
Phenomenon: Daily phenomena are found in the Opening			**DQ:** • **What is a reversible reaction?** • **What factors affect equilibrium reaction?** • **Write the equilibrium expression for a chemical reaction** • **How do you describe chemical equilibrium?** • **What happens when chemical equilibrium changes?** • **What are the properties of an acid?** • **What are the properties of a base?** • **Differentiate between Arrheniueos acid and Bronsted Acid.** • **What are pH and pOH?**		
	Day 16	**Day 17**	**Day 18**	**Day 19**	**Day 20**

Learning Target	**SWBAT** define equilibrium, write the equilibrium expression, and calculate the equilibrium constant**.** **Focus Question:** How do you describe chemical equilibrium & calculate equilibrium concentrations?	**SWBAT** predict the shifts of equilibrium when condition changes in a chemical reaction. **Focus Question:** What happens to the equilibrium when conditions change?	**SWBAT** define acids and bases according to Arrheneous and Bronsted Lowry. **SWBAT** explain the properties of acids and bases. **Focus Question:** What are acids and bases?	**SWBAT** calculate the pH and pOH of a substance. **Focus Questions:** What are pH and pOH?	**SWBAT** solve pH problems. **Focus Question:** What makes an acid or base strong or weak?
Opening **(10-15 minutes)**	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What happens when chemical equilibrium changes? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: Why would the acidic water erupting from this geyser burn your skin? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.

Guided Practice/Transition (20 minutes) **Key Vocabulary:** • Molar mass • Atoms • Percent Composition • Empirical Formula • Molecular Formula • Grams • Mole	**TTW** introduce the lesson with a SMOG PHENOMENON. **TSW** complete the THE EXPLANATION GAME. **TTW** use a graph and PowerPoint to explain the equilibrium CHEMICAL EQUILIBRIUM **TTW** use more practice problems on page 530.	**TTW** balance a meter rule on a pivot, adding weights on both sides. **TTW** change the positions of Balance by adding more weights or removing weights to mimic stress. **TSW** write down their observations in their journals. **TTW** use the PowerPoint to explain Le Chatelier's Principles. LE CHATELIER'S PRINCIPLE **TTW** use more practice problems on page 540.	**TSW** use litmus paper and indicators to test the properties of acids and bases with different substances. **E.g., vegan, Oranges, Apples, Milk, HCl, and NaOH** **TTW** ask students to classify items as acids or bases. **TTW** discuss the pH scale are discussed and classified as 0-6.9 AcidS.7 =Neutral 7.1-14 baseS. **TSW** classify these items according to their pH as acid or base**.** **TTW** explain conjugate acids and conjugate bases, pg 562. **TSW** copy the table on pg. 565 into their notes. **TTW f**ollow the PowerPoint to differentiate between Arrheneous and Bronsted ideas of acids and bases	**TTW** lead students to determine the concentration of a solution in terms of H+ using [H+]=10e-pH. **TTW** use the example on page 575 to write Kw of water pH and pOH Calculation **TTW** lead the discussions on using pH=-Log10[H3O] to calculate the pH and pOH.	**TSW** complete pH Analysis Gizmo warm up. **TTW** review the gizmo warm up. **GIZMOS pH Simulation**
Independent Practice (45-50 minutes)	**TSW** complete the practice problems on the PowerPoint **CHEMICAL EQUILIBRIUM PPT** **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete problems on Powerpoint on ICE **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete an introduction to acids and bases: Explore and explain Arrhenius acids, and Bronsted acids on an ebook **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** work in groups of 3-4 students to complete pH Pivot activities**.** **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** work in pairs to complete pH Analysis Gizmo. **TTW will modify the worksheet. Students can find answer keys online*** **TTW** circulate the room to provide support by asking probing questions to guide student thinking.

Assessment/Summary (5-10 minutes)	**TSW** complete page 532 #3 and #4.	**TSW** complete problems on page 540.	**TSW** complete a lesson check introduction to acids and bases ebook.	**TSW** complete questions on page 582.	**TSW** write a CER that answers the focus question: What makes an acid/base strong/weak?
Small Group Tasks (TBA)					

Week 5					
GSE: SC6c.d.	**Focused Concept: Titrations** • **Titrations** • **Molarity** • **Solubility**				
Phenomenon: Daily Phenomenon are found in the opening			**DQ: The following questions should be the focus of week 5:** • **How would you prepare standard solutions for specific concentrations?** • **How would you use titration to determine the molarity of an acid or base?** • **What are pH and pOH?**		
	Day 21	**Day 22**	**Day 23**	**Day 24**	**Day 25**
Learning Target	**SWBAT** calculate the amount of solute to make a standard solution. **SWBAT** calculate the amount of solvent required to make a standard solution. **SWBAT** prepare and labeled a standard solution. **Focus Question:** How do you prepare a standard solution?	**SWBAT** study the concentration of solutions in terms of molarity. **SWBAT** calculate the number of moles of a solute in a solution. **Focus Question:** How can you describe the concentration of a solution?	**SWBAT:** calculate the approximate pH of a strong acid or base. **SWBAT** use an indicator to measure how much titrate is required to neutralize an analyte. **SWBAT** use titration to determine the concentration of an analyte. **SWBAT** choose an appropriate indicator for titrations involving weak acids. **Focus Question:**What makes an acid or base strong or weak?	**SWBAT** review basic titration concepts and terminology. **SWBAT** perform a titration using the two-step method. **SWBAT c**ollect data for the volume of base used. **SWBAT** calculate the molarity of the acid. **Focus Question:** What happens when acids and bases react?	**SWBAT** answer 80% of unit 3 questions correctly.

Opening **Key Vocabulary:** • Titration • Standard solution • Concentration • Molarity • Indicator • Equivalence point • Analyte • Titrant • Neutralization	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: Do all mixtures have a uniform composition? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: How can you describe the concentration of a solution? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: Why would the acidic water erupting from these geysers burn your skin? What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share observations and develop questions. • TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	TTW allow students to review their notes and ask questions
Guided Practice/Transition	**TTW** prepare standard solution. **TTW** demonstrates how to prepare a standard solution. **TSW** take notes. PREPARING SOLUTION AND MOLARITY	**TTW** lead students to discuss the molarity calculations using the PowerPoint notes with examples.	**TSW** complete part 1 of the Equillibrium: Weak and Strong Acids. **TTW** use the Acid and Base Notes to define acids and bases. TTW assign students the template for guided notes.	**TTW** guide students through the virtual titration on the ebook introduction and safety discussion.	**TTW** assign review questions for the unit 3 test.
Independent Practice	**TSW** work in groups of 3-4 students to complete Pivot Interactives for Preparing Solutions. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** work in groups of 3-4 students will complete the Pivot Interactives for Molarity. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** work in groups of 3-4 students to complete part 2 & 3 of Equillibrium: Weak and Strong Acids. Acid-Base Solutions phet Simulation. **TTW** circulate the room to	**TSW** will work in groups of 3-4 students to complete the virtual titration. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW c**omplete the unit 3 test in illuminate.

			provide support by asking probing questions to guide student thinking.		
Assessment Summary	**TSW** will complete the evaluation on pivot**.**	**TSW** will complete the pivot assessment.	**TSW** complete the Lesson check on the strengths of acids and bases.	**TSW** write a CER: What happens when acids and bases react? **Homework:** questions 41-43 on pg 588.	**TTW** check responses on the unit test checked for mastery. **TSW** reflect in their data notebook.

Assessment Prep::
Prepare students for assessment by reviewing the following Assessment Prep concepts.-Gas Laws, Solubility graphs interpretations and reading,Hess's law,Enthalpy,Reaction rate order,collision theoryChemical equilibrium pH and pOH ,acids and bases

Labs / Investigations		
Mandatory Labs	**Explore Learning Gizmo**	**Pivot Interactives/Phet**
Boyel's Law/Charles' Law	**Colligative Properties of water** **pH acids and bases**	**Solutions and solubility** **Molarity** **Preparing solution**

Additional Resources/Tasks	
Supplemental Resources	**pHet simulations on acids and bases, Titrations** **McGraw Online Assessments** **Learnsmart**